STORM WATER QUALITY

Post Construction Bulletin

The Post Construction Bulletin is prepared by the Post Construction Inspection Team to provide a feedback loop to the Functional Units for possible program improvements per the National Pollutant Discharge Elimination System (NPDES) permit requirements.

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Control of Highway Runoff at Bridge Structures

Inappropriate control of surface flows at the limits of bridge structures can be a serious oversight. Concentration of runoff at these locations has the potential to contribute to soil erosion. This can jeopardize the stability of project features and aesthetics, while at the same time negatively impacting water quality.

The Problem

Unless addressed appropriately in the project design phase, bridge railings can concentrate highway runoff, which is often allowed to flow in an uncontrolled form down adjacent embankment slopes.

Scour around bridge railing

The concentrated flow can lead to localized erosion, which may affect the stability of bridge abutments or other structures.

Erosion adjacent to bridge abutment

Unforeseen Consequences

The severity of the erosion potential may not be apparent until after the damage has been done – in some instances, the damage can be significant. At one site observed by the Post Construction Inspection Team, a severe storm event had occurred immediately following project construction. At a bridge railing location where highway runoff had not been adequately controlled, runoff was unintentionally focused down a steep embankment that had no drainage control features. Consequently, substantial erosion occurred. Prior to project construction, the embankment had not been subject to attack by concentrated flows.

Slope replacement due to runoff damage

The resulting embankment erosion threatened the stability of the roadway and bridge abutment. The embankment had to be rebuilt and protected, adding millions of dollars to the project cost.

Improper Remedies

The Post Construction Inspection Team also observed that less than optimal techniques are sometimes being utilized to repair the localized erosion problem rather than address the source.

Improper treatment using concrete sacks

In the photo above, concrete sacks have been used to rebuild and protect a slope that had experienced localized erosion. This technique may temporarily halt further progression of the erosion, but its long-term effectiveness and stability is not assured. These impromptu, short-term solutions can be undermined in subsequent storm events and may require excessive future maintenance and repair efforts.

Recommended Approach

The Caltrans Highway Design Manual (HDM)–5th Ed., Chapter 800, provides the principles for the proper sizing and placement of drainage features on roadways. Coordination with the Engineering Service Center (ESC) is required when placement of drainage collection systems are required near bridge railings, abutments, retaining walls and other structural discontinuities.

The HDM and Caltrans Standard Plans provide guidance and details for drainage collection components so as to capture or intentionally redirect flow, thus avoiding localized embankment erosion.

Examples

Asphalt dikes may be used to control runoff within the shoulder limits, and to guide it to a drainage feature. Alternatively, down drains may be installed at the location of the railing terminus, to collect and transport roadway runoff down the embankment in a controlled manner.

Proper treatment using an asphalt dike

Summary

Structural discontinuities such as bridge railings or dikes that end abruptly (particularly under metal beam guard railing) are common locations for unintentional flow concentration and redirection. Extra attention should be given to these areas in the design phase to avoid unnecessary water quality impairment and future maintenance and/or project reconstruction efforts.

Additional information is available in the Caltrans Storm Water Quality Handbooks. Questions or comments may be directed to: Chris Herencia • Caltrans Division of Environmental Analysis (916) 657-5381 or
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